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In spite of recent progress in national studies of the impact of student financial aid, there are still many ambiguities about whether student financial aid has a measurable effect at the institutional level. This paper proposes models and suggests methodologies that institutions can use to conduct their own research on the impact of student financial aid, using existing data sources. Student financial aid administrators can, and should, play an integral role in such research because their student aid expertise can be valuable in formulating research questions and interpreting research findings. Well-designed and executed institutional research on the effect of student aid cannot only help resolve ambiguities about the impact of student aid, but can also provide useful information for institutional financial planning.

During the 1980s, substantial controversy emerged about whether student financial aid actually had an impact on student choice. Recent national research indicates that while the effect of student financial aid may be minimal compared to other factors that influence student choice—such as family background and student academic preparation—it does, nevertheless, have a consistent positive influence (St. John, 1991c). It is also a profitable area of public investment—the federal government receives substantially more in increased tax revenues from student aid than it spends (St. John & Masten, 1990). However, there is still controversy at the institutional level about whether student aid has an effect on student matriculation. Institutional research does not consistently find that receipt of financial aid has an impact on matriculation (Tinto, 1990), which is contrary to the experience and observations of most financial aid administrators.

One possible reason for these uncertainties in institutional research about the influence of student aid is that inconsistent logical models and statistical methods have been used. As long as these inconsistencies persist, it will remain difficult to determine under what conditions aid is effective. This suggests that the models and methods used in institutional research should be refined.

Student financial aid administrators play an important role in designing and interpreting institutional research on the impact of student aid. Their knowledge of aid packaging philosophies, federal student aid programs, and student characteristics is integral to the execution of viable research. Yet there are many obstacles to overcome before financial aid administrators, institutional researchers, or any other research-oriented administrators can investigate the impact of student aid without substantially disrupting their normal work activities.

This article develops workable models for assessing the effects of student aid on first-time attendance and persistence decisions. These models, based on recent national research, use existing institutional

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data sources. Not only are existing data sufficient for quality research on the impact of student aid, but, in most institutions, statistical analyses can be conducted on personal computers. Therefore, there is little reason not to engage in institutional research on this important topic.

A New Role for Financial Aid Administrators

Financial aid administrators already have one of the most difficult jobs on college and university campuses. First, they must be aware of, and sensitive to, changing student financial needs. Second, they are an integral part of campus enrollment-management strategies which often combine financial aid administrators with admissions officers and other key administrators in new, more complex, administrative units that require keen political skills. Third, they must be knowledgeable about federal and state programs and be able to comply with diverse program regulations as part of their daily operations. Fourth, they need to be knowledgeable about information technology, since student aid systems are among the most sophisticated automation systems on campus and require interfaces with other internal and external systems (St. John, 1985; 1986). Financial aid administrators are also expected to play an active role in quality control and improvement (e.g. St. John & Sepanik, 1982). So why should they take on responsibility for research on the impact of student financial aid?

One of the problems is that research on the effects of student financial aid has been inconsistent. A recent review of institutional research on persistence (Tinto, 1990) concluded that student aid does not have a measurable impact; however, some studies have shown that aid is effective (e.g. Voorhees, 1985). Unfortunately, this perception could further impair funding for student financial aid. Therefore, well-conceived institutional research on the impact of student aid is needed.

Another problem is that institutional research from diverse settings is needed. Higher education is not monolithic; therefore research should explore how students in different settings respond to different types and amounts of aid offers. Studies of the effects of student aid in similar institutional settings can inform administrators about how their students may respond to changes in aid or pricing policies. It is more difficult for campus officials to reach these conclusions from national studies.

Research that considers the amount of different aid offered seems especially timely. The assumption that students are price responsive to student aid as well as to tuition has been integral to the concept of enrollment management (e.g. Hossler, 1984, 1987). However, most of the student-demand studies used to develop the standardized student price-response coefficient are old. (The coefficient is the change in the enrollment rate of 18- to 24-year-old potential first-time students facing a $100 price change.) Leslie and Brinkman (1988) concluded that their study of the standardized student price-response coefficient is most applicable to tuition, because most of the studies they reviewed considered tuition but not student aid. Yet, college and university tuition charges increased substantially faster than inflation during the past decade and enrollments were higher than projected. Clearly, the research base is not adequate.

Recent national studies of student price response have concluded that: 1) student enrollment and persistence decisions are more responsive to student aid than to tuition (St. John, 1990a & b); 2) low-income students are highly price responsive to grants but not to loans (St. John, 1990a); 3) middle-income students are more price responsive to loans than to grants (St. John, 1990b). These findings help explain why, given the increased emphasis on federal loans and declines in federal grants, overall enrollments were higher than projected, while minority (mostly low-income) participation rates declined (St. John, 1991a). However, more institutional research on these issues is also needed.

The financial aid administrator is a potentially important member of an institutional research team formed to examine the impact of student financial aid. Financial aid administrators usually have a good understanding of financial aid policy issues that can be useful in the formulation of a research agenda and the interpretation of research results. They also have data that are necessary for such research. Other appropriate members of such a team include representatives from: institutional research, to conduct such analyses; admissions, to provide information on applicants; and student records, to facilitate the extraction of student records, as appropriate.

Workable Models

Two types of *enrollment decisions* need to be examined more frequently by institutional researchers: *first-time attendance* which involves decisions by new applicants to enroll for the first time; and *persistence* which includes decisions by currently enrolled students to return. To be viable, new models for investigating the impact of student aid on these enrollment decisions must meet five criteria.

1. They must include the various factors, in addition to student aid, that influence student enrollment decisions.
2. They must be developed and tested using data from existing institutional data sources; otherwise the research would not be widely undertaken.
3. The research must be conducted using appropriate statistical methods under conditions that are prevalent in most colleges and universities.
4. There must be sufficient information on each of the various factors in the logical model so that the influence of student aid can be measured.
5. And finally, the results must be useful to institutional administrators.

If these conditions are met, then it is possible that student aid research will be widely conducted. The following logical models for first-time attendance and persistence were developed to illustrate how campuses can create local models that meet these criteria.

Logical Models

Institutional research on the impact of student aid can be grounded in economic theory on student demand, sociological theory on educational attainment, and policy research on student choice. The early

student-demand studies demonstrated a relationship between institutional prices and student enrollment decisions (Jackson & Weathersby, 1975); however, they were appropriately criticized for not controlling other variables that could influence student decisions (Dresch, 1975). Sociological research on educational attainment (e.g. Alexander & Eckland, 1975) examines the linkages between an individual's background and his or her educational decisions, but does not consider the role of institutional characteristics or actions, which is necessary for research on the impact of student aid. Student-choice research (especially Terkla & Jackson, 1984) provides a basis for deciding among institutional variables in the development of new models. Based on reviews of these areas of inquiry, models were developed for assessing the impact of student aid on first-time attendance (St. John, 1991b; St. John & Noell, 1989) and on persistence (St. John, 1989; St. John, Kirshstein, & Noell, in press) using national data bases. These models are used here as the basis for the logical models proposed below.

Full-Time Attendance

Accepted applicants must be considered when conducting institutional research on attendance, since this is the only population that can be directly influenced by institutional pricing policies (e.g. tuition charges and student aid allocations and packaging). This model views *first-time attendance* as a dichotomous outcome—either applicants attend or they do not. Decisions by accepted college applicants to attend college are appropriately viewed as a function of social background, academic preparation, and student aid (or prices). The types of variables related to each factor that should be considered in the model are described briefly below, and are specified in Appendix 1.

Social background typically includes such variables as age, ethnicity, gender, income, financial need, parents' occupations, marital status, and dependency status. Such data, with the exception of income and parental occupations, are usually routinely collected as part of the admissions process. The most critical variable is financial need, which can be identified from financial aid records. Income, which is usually collected for financial aid applicants but not for all applicants, can be used to create a set of dichotomous variables that controls for financial need. (See Appendix 3.) The choice of other background variables will depend on the characteristics of the institution. For example, it is desirable to control for age if the analysis is for a large public college that attracts a diverse student population, but it may not be necessary in a private college that targets traditional college-age students.

Academic preparation includes high school grades, high school track, test scores, and aspirations. Whether any of these variables are routinely collected will depend on a college's admissions process. At a minimum, either high school grades or standardized test scores are necessary. These are typically highly correlated (Terkla & Jackson, 1984); therefore, one of these measures is probably adequate. Usually an institution will collect one or two of these measures as part of the admissions process. If this is not the case—a possibility in some open-admissions institutions—then analysis of first-time attendance should

not be attempted. In this case, institutional research should concentrate on persistence.

Research consistently shows that student aspirations, as measured in high school, have an impact on attendance (St. John & Noell, 1989) and persistence (St. John, 1989). In these logical models, student aspirations have been included in academic preparation. Unfortunately, many institutions do not routinely collect data on student educational aspirations, although it may be possible to obtain such data if the American College Testing (ACT) or the College Scholarship Service (CSS) are used as multiple data entry contractors. If it is not possible to consider aspirations, this void will not cause substantial problems, as long as other variables related to academic preparation are considered.

Analyses should first consider the impact of *student aid*, focusing on the receipt of the aid offer. The basic student record for aid programs should include an indication of the type and amount of each sudent aid award.

Persistence

The decisions by currently enrolled students to persist are affected by social background, academic preparation in high school, college achievement, college experiences, and student aid (and price). The variables related to each factor that should be included in the model are described briefly below and summarized in Appendix 2.

Persistence is defined as the decision to reenroll during a subsequent semester or year. Analyses of within-year persistence (the decision to return the subsequent semester) or year-to-year persistence (the decision to return the next year) are probably of more interest to institutional policy on student financial aid and tuition than research on the number of months or years completed, which are alternate measures of persistence.

Variables related to two of the factors in the model—social background and academic preparation—will not change from year to year. Therefore, it is possible for institutions to track college classes through the matriculation process, from first-time attendance, by retaining the original variables related to background and preparation and only adding new variables to the data set.

Student aid and price variables must change from year to year (or semester to semester), if the impact of aid is to be assessed. A base year or base semester should be set for each persistence analysis. The tuition the student pays (if it is included in the model) and the aid awarded should be added to the model. All institutional offers of loans should be added, even if all the loans are not accepted by the student, since institutions should be concerned about how student enrollment decisions respond to actual offers.

Two measures of *academic experience* should be considered: college grades and full-time attendance. Grades are analogous to (or closely associated with) the academic integration factor that is integral in Tinto's widely used model (Tinto, 1975, 1982; Wolfle, 1985). Full-time attendance influences whether students get financial aid, and the amount of aid they receive. Attending full-time consistently has a great influence on persistence (St. John, 1989).

Finally, factors related to *college experiences* can be added. This gives institutions an opportunity to assess how institutional factors such as participation in special retention programs, selecting certain academic majors, and involvement in extracurricular activities influence persistence. Logically, it is not necessary to include variables related to college experience in order to assess the influence of student aid on persistence. Therefore, institutional preference should be used to guide decisions about whether to include these variables and, if so, which ones to include.

Data Sources

It is possible to compile appropriate data on each of these factors from existing institutional sources. First, the student aid office generates and maintains information on financial aid offers made to applicants and currently enrolled students. Student aid records probably will be needed also for assessing income and dependency status. Additionally, financial aid records are needed for information on financial aid and aid packages.

Admissions records are necessary to use the attendance model. In particular, they provide information on social background (ethnicity, gender, age, etc.) and academic preparation (e.g. test scores, grades, etc.). Therefore, it is desirable to draw appropriate data elements from admissions records before they are sent to archives.

Information on college grades from student records is also needed, especially for analyses of persistence. Additionally, information on majors may be relevant under two conditions. First, institutions may be interested in whether students in a particular major or type of major are more or less likely to persist, controlling for other background factors. In this case, a very small number of majors or types of majors should be selected and coded as dichotomous variables. Alternately, institutions may wish to codify their majors by levels of expected earnings, which has been shown to have an influence on major choice (Andrieu, 1991; St. John and Noell, 1987). If persistence is routinely tracked semester to semester or year to year, then it would be possible to program the student record system to automatically generate the necessary data.

Finally, information from other program areas may be needed, if it is not routinely collected as part of the student record system. For example, if student participation in special retention programs was not included in student record systems, then it would need to be added from program records.

The sample size will depend on the size of the institution. In most institutions, it may be desirable to examine the entire applicant population and to follow all admitted students through the matriculation process. In very large institutions, a sample can be taken using random numbers. However, unless there are many thousands of students in each cohort, such a sampling procedure would not be needed if a mainframe computer were used in the analysis. If personal computers are used, then smaller samples may be more workable.

Statistical Methods

Recommendations on statistical methods are based on three considerations: 1) college and university administrators should be most con-

cerned about probabilities that accepted applicants will enroll and actions that can positively influence those probabilities; 2) statistical methods should be simple enough so that research can be executed without highly specialized statistical expertise; and 3) it is preferable that price-response measures can be easily developed. In the long term, it may be desirable to move toward structural models, such as path analysis, that specifically examine the interaction among factors in the model (e.g. Vorhees, 1985). However, this step, which is labor intensive and takes specialized expertise, is not necessary to estimate the effects of student aid. Therefore a simpler approach is recommended here.

Based on these considerations, two specific statistical procedures are recommended. First, logistic or probit regressions are appropriate for analyses of qualitative outcomes, such as the decision to attend or persist in college (Aldrich and Nelson, 1984). Both logistic and probit regression procedures are now a standard option in mainframe statistical packages such as SAS or SPSS^{X}. In fact, this procedure is an option in some statistical packages available for personal computers, such as the PC version of SPSS and other statistical packages for PCs. Therefore, the recommended procedure can be implemented in most institutions without major difficulties. The results of the logistic and probit analyses are very similar (Aldrich and Nelson, 1984) and the choice between them will depend on the researcher's preference, as well as the capabilities of the particular software package used.

Second, it is recommended that a procedure be used to convert the logistic (or probit) betas (provided in the computer printout) for each independent variable to change probability measures (delta-p statistics), a step not available on most statistical packages. (Recommendations for developing and interpreting delta-p statistics are presented in Appendix 4.) In combination, these procedures will make it possible to use price-response measures for student aid variables, providing they are properly specified and statistically significant.

Creating Workable Models

In the development of institutional models that assess the impact of student aid on attendance and persistence, it is recommended that rules governing the use of logistic and probit models be closely followed (e.g. Aldrich and Nelson, 1984; Husmer and Lemeshow, 1989). Given the fact that institutional data sources do not contain all the information necessary for a perfect model, the researcher should include an appropriate variable (or variables) related to each factor. For example, the lack of availability of income data for non-aid applicants should be readily acknowledged, in spite of the recommended procedures for controlling for this deficiency (Appendix 3). The fact is that most quantitative research includes imperfect data. The goal of the institutional researcher, therefore, is to create strategies for developing the best possible model, given the data constraints.

The Effect of Student Aid

The purpose of the proposed models is to estimate the effect of student aid on student enrollment decisions. A sequence of logistic regressions can be used to test each model. This involves a series of regressions, entered in a planned sequence, adding variables related to each factor

one step at a time. For examples of how sequential logistic regressions can be used to test a new model, see St. John (1991b) or St. John, Kirshstein, and Noell (1991). Once a basic model has been developed, it can be used in several ways to explore the impact of student aid.

First, it is recommended that the impact of receiving any type of student aid be examined as a first step. Using this procedure, any student or applicant who received an aid offer (coded as "1") is compared to non-aid recipients (coded as "0").

Second, it is also possible to use this basic type of model to examine the influence of different types of student aid packages. Using this approach, a series of dichotomous variables is used for each combination of packages that is evident in sufficient numbers.

Third, price response can also be considered. This involves using numeric scales for the amount of aid received. A three-step procedure is recommended:

1. Consider price response for all aid. If this variable has a significant (and positive) beta, then the delta-p statistic can be interpreted as meaning that each additional dollar increases the probability of attending (or persisting) by a certain percentage point.

2. The model can be revised to develop price-response measures for different types of student aid. Recent national studies have found that different types of student aid have different price-response measures (St. John, 1990a & b).

3. It may be possible to develop price-response measures for different income groups, providing the overall sample is of sufficient size and if the institution has data on the family income of all applicants. If this step is taken, then the analysis could generate different price-response measures for different income groups (e.g. St. John, 1990a).

Conclusions

This article has proposed models that institutional researchers can use to examine the effects of student financial aid. The execution and publication of institutional studies using logically consistent models and comparable statistical methodologies is desirable for several reasons.

First, there are lingering doubts about the effectiveness of student aid. More institutional research could help resolve these doubts by answering questions about why financial aid is significant in some situations and not in others.

Second, more published institutional research on first-time attendance decisions can inform policymakers at all levels about the role of student aid in promoting student choice of school. If these studies use consistent methodologies, it will be possible, through meta analyses, to address some basic questions about what kind of aid promotes student choice in different settings. [Meta analysis is a procedure for comparing and standardizing coefficients across studies. The use of this procedure in the reanalysis of student aid research is included in Leslie and Brinkman (1988).]

Third, published institutional research on persistence using this type of model can inform planners and policymakers at all levels about

what types of programs improve student persistence. Such information could improve substantially the capacity of institutions to reduce the number of dropouts.

Fourth, if institutions do develop price-response measures, they can be used to spark a new generation of planning models in higher education. With their own price-response measures, it will be possible for institutions to refine their enrollment and budget-planning processes.

Clearly there are compelling reasons why there should be an increased emphasis on institutional research that considers the impact of student financial aid. Financial aid administrators can play an important role in stimulating new institutional studies. Certainly their expertise is important to the design and interpretation of institutional studies. While it may be true that many financial aid administrators are not trained in research methodologies, there are usually faculty members, institutional researchers, or graduate students with whom they can collaborate to conduct such studies. ✦

Appendix 1:
Specifications for Basic Attendance Model

Factor/Variable	Probable Data Source	Recommended Coding	Variate Type	Comments
Student ID	All Sources	NA	NA	Necessary to complete record from different sources
I. *Social Background*				
A. Gender	AD	Male = 1 Females = 0[1]	DI	Compares males to females
B. Age	AD	Years	N	Measures changes in probability of attending for each year of age
C. Ethnicity[2]				
Black	AD	Black = 1 Other = 0	DI	Compares Blacks to others (except Hispanics)
Hispanic	AD	Hispanic = 1 Other = 0		Compares Hispanics to others (except Blacks)
D. Dependency Status	SA	Independent = 1 Others = 0	DI	Controls for the interaction between dependency status and income
E. Financial Need[3]				
High need[4]	SA	Low income = 1 Other = 0	DI	Compares high need applicants to all others (excluding other aid applicants)
Moderate need	SA	Lower-middle income = 1 Others = 0	DI	Compares moderate need aid applicants to other non-aid applicants
Low need[5]	SA	Upper-middle income = 1 Others = 0	DI	Compares low-need aid applicants to other non-aid applicants

Factor/Variable	Probable Data Source	Recommended Coding	Variate Type	Comments
II. *Academic Preparation*[6]				
A. Test Scores	AD	Scale[7]	N	Measures changes in probability of attendance for each test score increment
B. High School	AD	Scale	N	Measures changes in probability of attendance for each grade point increment
C. Aspirations Some College	AD	Some College or less = 1 Other = 0	DI	Compares students who aspire to complete some college (or less) to those who aspire to complete Bachelor's
Advanced Degree	AD	Advanced Degree = 1 Other = 0	DI	Compares those who aspire to an advanced degree to those who aspire to complete Bachelor's
III. *Student Aid/Prices*[8] (use variable set A, B, or C)				
A. Any Aid	SA	Received aid	DI	Use to measure whether receipt of aid increases probability of attendance
B. Packages[9]				
Grants only	SA	Grants only = 1 All others = 0	DI	Compares recipients of this category to non-aid recipients
Loans only	SA	Loans only = 1 All others = 0	DI	Same as above
Loans and Grants	SA	Loans and Grants = 1 All others = 0	DI	Same as above
Loans and Work	SA	Loans and Work = 1 All others = 0	DI	Same as above
Grants and Work	SA	Grants and Work = 1 All others = 0	DI	Same as above
All types	SA	All three types = 1 All others = 0	DI	Same as above
C. Amounts (Approach used for price-response analysis)				
Grants/Subsidies	SA	Amounts divided by $1,000	N	Provides price response measures for grants
Loans	SA	Amounts divided by $1,000	N	Provides price response measures for loans
Work Study	SA	Amounts divided by $1,000	N	Provides price response measures for work study

Factor/Variable	Probable Data Source	Recommended Coding	Variate Type	Comments
IV. *Attendance*				
Attend	AD	Attend = 1 Not attend = 0	DI	Measure used for baseline probability of attending

Scale: Variate Type
N = Numeric
DI = Dichotomous

Scale: Data Source
SA = Student Aid
AD = Admissions
SR = Student Records

[1]Reverse coding (females = 1, males = 0) equally viable
[2]Recommend treating Black and Hispanic separately since these groups are historically underrepresented in higher education.
[3]If the institution maintains information on all students in admissions or student records, then the source used for all students' income would be admissions. Income is used as a proxy for financial need. The explanation for this recommendation is discussed in the text as well as in Appendix 3.
[4]Recommend using a single variable for dependent and independent students. The inclusion of "dependency status" controls for differences between dependent and independent students.
[5]Includes all upper-middle- or upper-income aid applicants unless there are sufficient upper-income applicants to create a fourth variable.
[6]At a minimum, either high school grades or test scores are necessary for the analysis. Other variables can be added.
[7]Use ETS/ACT crosswalk if necessary.
[8]Not possible to use tuition unless school has different tuition charges. Three sets of aid variables used in separate analyses.
[9]For all aid package variables, students who do not receive aid (and do not apply) are coded as zero.

Appendix 2: Specifications for Workable Persistence Model

Factor/Variable	Data Source	Coding	Variable Type	Comment
ID	All		N	Necessary to merge data files
I. *Social Background*				
Same as Student Attendance Model (Appendix 1)				
II. *Academic Preparation*				
Same as Student Attendance Model* (Appendix 1)				
III. *Academic Experience*				
College Grades	SR	Actual Grade Point Average**	N	Will provide indicator of change in probability of persistence attributable to each grade point change.
Major Cat1*	SR	Major = 1 Others = 0	DI	Will provide a measure of change in probability of persistence attributable to the program
Major Cat2*	SR	Major = 1 Others = 0	DI	Same as above
IV. *College Experiences*				
A. Special Program	SR	Program = 1 Others = 0	DI	Same as above

Factor/Variable	Data Source	Coding	Variable Type	Comment
B. Extracurricular Activities	SR	Activities = 1 Others = 0	DI	Same as above

V. *Aid/Prices*

Same as Student Attendance Model (Appendix 1) except base period aid variables should always be used.

*Optional feature

**Lowest grade codes as lowest number. Highest grade codes as highest number.

Appendix 3: The Use of Dichotomous Variables for Financial Need

The use of dichotomous variables is recommended when using logistic regressions. In a recent study of graduate student persistence, Andrieu (1991) compared the use of a continuous income variable coded in dollar amounts to the use of a series of dichotomous variables. Her analysis found not only that the use of dichotomous variables reduced the unexplained variance, but also showed that the influence of income is not linear. Therefore, the use of dichotomous variables is desirable for financial need.

Many institutions do not collect information routinely on family income for all students (unless they request this information from College Board or Scholastic Aptitude Test files, and require these tests of all students). When logistic regressions are used, it is possible to control for the influence of income through the use of dichotomous variables.

The first step is to create a dummy variable for dependency status (either dependent or independent, whichever is smaller, coded as "1" with the opposite being coded as "0"), which controls for income differentials between those who report personal income and those who report family income.

Second, three separate dichotomous variables can be created: one for high-need (coded as "1" for aid applicants with low income and all others coded as "0"); one for moderate need (coded as "1" for applicants in lower-middle income and "0" for all others); and one for low-need aid applicants (coded as "1" for applicants in upper-middle income and "0" for all others). These variables control for the influence of *financial need*, even though income is not known for all applicants. The results should be interpreted as indicators of the level of financial need.

Appendix 4: Delta P Statistics

Formula

The following formula is recommended for converting betas for logistic or probit analyses into change in probability measures (Delta-p statistics):

$$\text{Delta-p} = \exp(L_1)/[1+\text{esp}(L_1)] - \text{esp}(L_0)/[1+\exp(L_0)]$$

where:

L_0 = Ln p/(1-p) (p = "baseline p" in table)

and

$L_1 = L_0$ + Beta (Petersen, 1984)

When these betas are significant, they help explain the impact of aid on the probability of first-time attendance (or persistence).

Interpreting Delta-P Statistics for Student Aid

First, when the impact of receiving any type of student aid is being examined, and the beta is significant for the financial aid variable, then the delta-p statistic for this variable is positive and could be interpreted as increasing the probability of attending or persisting by a certain percentage point. For example, if the delta-p was .085 for a significant beta in an attendance model, then it could be interpreted as meaning that the receipt of student aid increased the probability of attending by 8.5 percentage points.

More generally, either a positive or neutral beta coefficient for an "any aid" variable can be interpreted as meaning student aid is effective. A neutral coefficient means students with aid, many of whom could start college with disadvantages, persist as well as nonaided students, who usually start without disadvantages. And a negative coefficient does not necessarily mean that aid has a negative influence; rather it could mean that aid is not sufficient (e.g. St. John, Oescher and Andrieu, 1991).

Second, when the influence of different types of aid packages is examined and the

logistic regression betas for a particular aid package are significant, then the delta-p statistics can be interpreted as meaning that the receipt of that type of package increases the probability that a student will attend (or persist) by a particular number of percentage points. (For example, a delta-p of .089 could be interpreted as meaning that a particular type of package increases the probability of attending, or persisting, by 8.9 percentage points).

This type of analysis is appropriate when there are questions about the effectiveness of different types of student aid. Unfortunately, since not all types of packages are consistently significant each year, it may take several analyses, possibly over several years, to conclude that a particular type of package is not effective. Therefore, it may not be desirable to undertake this particular type of analysis at the institutional level.

Third, when the amount of aid is used in either model, the delta-p statistics for these can be interpreted as price-response measures. For example, if a delta-p for a significant aid variable is coded as 1 = $1,000, then a delta-p of .045 can be interpreted as meaning that a thousand dollar increase in student aid increases the probability of attending (or persisting) by 4.5 percentage points—or that a $100 dollar increase increases the probability of persisting by 0.45 percentage points. This type of information can be extremely useful to institutional planners. It can be used to inform decisions about what types of aid to invest in. If this step is taken, the different types of aid should be combined into three categories—grants, loans, and work—unless there are sound logical reasons for more categories.

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